



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE APPLICATION OF:

JING CHUNG CHANG ET AL.

CASE NO.: SO0033USNA

APPLICATION NO.: 10/872685

GROUP ART UNIT: 1732

FILED: JANUARY 6, 2004

EXAMINER: BUTLER, PATRICK

FOR: PROCESS FOR PREPARING POLY(TRIMETHYLENE TEREPHTHALATE) FIBER

APPEAL BRIEF UNDER 37 CFR § 41.37

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the practice under 37 CFR 41.37, the following is a brief in support of the Appeal filed April 27, 2007, appealing the Rejection dated January 29, 2007.

Please charge any necessary fees associated with the Appeal Brief pursuant to 37 CFR § 41.20(b) (2), to Deposit Account No. 04-1928 (E. I. du Pont de Nemours and Company). The Commissioner is hereby authorized to charge any additional fees which may be required or credit any overpayment to Deposit Account No. 04-1928.

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INTRODUCTION

A Notice of Appeal against the final rejections was filed April 27, 2007. A Petition for an Extension of Time under 37 C.F.R. §1.136, requesting a three (3) month extension of time, is enclosed.

REAL PARTY IN INTEREST

The real party in interest is E. I. DuPont de Nemours & Co., Inc., a corporation of Delaware, the assignee of this application.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and/or interferences known to Appellants.

STATUS OF CLAIMS

Claims 1-42 were in the application as filed. In an Office Action dated June 3, 2005, all claims were rejected. Claims 1-42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Howell et al. (International Patent Publication No. WO 96/00808) in view of Hwo et al., (U.S. Patent Application Publication No. 2002/0130433 A1), Wandel et al. (U.S. Patent Application Publication No. 2002/0132116 A1), and Sun et al. (U.S. Patent Application Publication No. 2002/0147298 A1).

By amendment dated August 16, 2005, claims 2, 5, 9, 10, 18, 19, 21, 28, 35, 39 and 40 were cancelled; claims 43-56 were added; and claims 1, 6, 7, 13, 14, 22, 26, 27, 29, 30, 31 were amended.

In an Office Action dated November 16, 2005, all of the pending claims 1, 3, 4, 6-8, 11-17, 20, 22-27, 29-34, 36-38 and 41-56 were rejected. claims 1, 3, 4, 6-8, 11-13, 15-17, 20, 22-26, 29-34, 36-38 and 41-55 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Howell et al. (International Patent Publication No. WO 96/00808) in view of Hwo et al., (U.S. Patent Application Publication No. 2002/0130433 A1), Wandel et al. (U.S. Patent Application Publication No. 2002/0132116 A1), and Sun et al. (U.S. Patent Application Publication No. 2002/0147298 A1). Claims 14, 27 and 56 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Howell et al. (International Patent Publication No. WO 96/00808) in view of Hwo et al., (U.S. Patent Application Publication No. 2002/0130433 A1), Wandel et al. (U.S. Patent Application Publication No. 2002/0132116 A1), and Sun et al. (U.S. Patent Application Publication No. 2002/0147298 A1), and further in view of Burton et al., U.S. Patent No. 5,804,115.

In a response dated May 24, 2006, a Request for Continued Examination was submitted. In the subsequent Office Action, dated July 6, 2006, the rejections of record were maintained.

In a response dated November 6, 2006, claims 1-7, 9, 10, 12, 13, 15-18, 21, 22, 25, 27, 28, 30-32, 34-40, 43-45, 49, 55 and 56 were cancelled. Claims 8, 11, 14, 20, 23, 29, 33, 41, 46 and 47 were amended.

An Office Action finally rejecting all claims was issued on January 29, 2007. An interview between the Examiner and Appellants' representative on February 13, 2007 did not result in any claims being allowed. As reported in the Examiner's interview summary, "Mr. Lerman inquired about 'advances' in prosecution in the Office Action mailed January 29, 2007, page 2, paragraph 3." "Examiner Butler clarified that the 'advances' did not pertain to allowable subject matter and that they related to the amendments presented to cancel and amend the claims."

Claims 8, 11, 14, 20, 23, 24, 26, 29, 33, 41, 42, 46-48 and 50-54 are on appeal. All claims are rejected. Claims on appeal are listed in the Appendix hereto.

STATUS OF AMENDMENTS

There have been no amendments to the claims after final rejection.
The claims are presented as amended by Appellant in the response dated November 6, 2006.

SUMMARY OF CLAIMED SUBJECT MATTER

There is one independent claim, claim 47, which claims a process for forming poly(trimethylene terephthalate) bulk continuous filament yarn. The dependent claims add various other limitations, such as melt viscosity, filament denier, intrinsic viscosity, and draw ratio. The dependent claims also recite further processes including ply-twisting and heat setting the filaments, coating the filaments, and bulking the filaments, as well as a carpet made using the yarn.

Locations of support for these various features in the application are given below by the number of the claim in which they are recited. The features may be supported in additional locations in the application.

8. Page 7, lines 11-17.
11. Page 10, line 23.
14. Page 10, line 25.
20. Page 5, lines 35-36.
23. Page 6, lines 1-2.
24. Page 6, lines 3-4.
26. Page 10, line 3.
29. Page 7, lines 6-8.
33. Claim 33 as filed.
41. Page 7, lines 1-2.
42. Page 7, line 2.
46. Page 7, lines 19-20.
47. Page 6, lines 7-30; page 7 lines 4-20.
48. Page 10, lines 5-6.
50. Page 10, lines 13-15.

51. Page 10, lines 13-15.
52. Page 10, line 3.
53. Page 7, lines 5-7.
54. Page 7, lines 5-7.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 8, 11, 14, 20, 23, 24, 26, 29, 33, 41, 42, 46-48 and 50-54 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Howell et al., (International Patent Publication No. WO 96/00808) in view of Hwo et al., (U.S. Patent Application Publication No. 2002/0130433 A1), Wandel et al., (U.S. Patent Application Publication No. 2002/0132116 A1), Sun et al., (U.S. Patent Application Publication No. 2002/0147298 A1) and Burton et al., (U.S. Patent No. 5,804,115).

Claims 8, 11, 14, 20, 23, 24, 26, 29, 33, 41, 42, 46-48 and 50-54 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Howell et al., (International Patent Publication No. WO 96/00808) in view of Scott et al, International Patent Publication No. WO 99/19577, and Hwo et al., (U.S. Patent Application Publication No. 2002/0130433 A1).

ARGUMENT

Appellants have previously responded to the nonfinal office action of July 6, 2006. Appellants repeat some of their prior arguments here, with additional clarification, because Appellants respectfully submit that they have not been fully considered or appreciated by the Examiner.

The Invention

The present application is directed to a process of forming poly(trimethylene terephthalate) (PTT) bulk continuous filament yarn (claims 47, 8, 11, 14, 20, 23, 24, 26, 29, 33, 41, 42, 46, 48 and 50-54), and a carpet prepared from a ply-twisted, heat-set poly(trimethylene terephthalate) produced from a specified process (claim 42).

It is in general known to prepare poly(trimethylene terephthalate) bulk continuous filament yarn by the process of:

- (a) providing a poly(trimethylene) terephthalate chip;
- (b) drying the chip;
- (c) melting the chip;
- (d) extruding (spinning) the molten poly(trimethylene terephthalate) into filaments;
- (e) cooling the filaments;
- (f) converging the filaments;
- (g) drawing the filaments;
- (h) bulking the drawn filaments;
- (i) cooling the bulked filaments;
- (j) intermingling (entangling) the bulked filaments; and
- (k) winding the resulting filaments.

One feature that distinguishes the presently claimed invention from known processes is a combination of several specific operating parameters that allow, in the context of a continuous bulk yarn process, the filaments to be drawn at relatively high speeds of greater than 3000 meters per minute. The ability to draw the filaments at such speeds results in a significant productivity increase as compared to the processes known at the time the present application was filed.

In its current broadest context (claim 47), this combination of operating parameters includes:

- (i) the poly(trimethylene terephthalate) having a number average molecular weight of about 29000 to about 40000;
- (ii) the poly(trimethylene terephthalate) having an intrinsic viscosity of about 0.95 to about 1.04 dl/g;
- (iii) the poly(trimethylene terephthalate) having a melt viscosity of about 450 up to about 700 Pascals at 250°C and 48.65 per second shear rate;
- (iv) the poly(trimethylene terephthalate) being substantially dry prior to further processing (less than about 50 ppm water content);
- (v) melting the poly(trimethylene terephthalate) in a specified type of extruder (single screw);

- (vi) once the filaments have been formed (by extrusion), cooled and converged into a yarn, drawing the filaments at a draw ratio of about 1.1 to about 4.0 to result in an individual filament denier of greater than 10, and a converged filament (yarn) denier greater than 210;
- (vii) once the drawn filaments have been bulked, cooling the bulked filaments in a specified type of equipment (cooling drum);
- (viii) intermingling (entangling) the filaments concurrently with or after the bulking, and/or before, concurrently with or after the cooling; and
- (ix) winding the drawn, cooled, bulked, intermingled filaments on a specified type of equipment (wind-up machine).

It is the combination of operating parameters, and not any one individually, that provides the overall processing advantages. The productivity obtained using the process of the present invention was surprising and unexpected to Appellants.

The Primary Reference- Howell et al., (International Patent Publication No. WO 96/00808)

As correctly recognized by the Examiner, and as indicated in the Appellants' previous Response, Howell et al discloses a process for preparing poly(trimethylene terephthalate) bulk continuous filament yarn comprising steps (a-k) as broadly described above.

As detailed in the Appellants' previous Response, Howell et al also discloses a variety of different operating parameters, some (but not all) of which individually may be considered to overlap with some of the parameters required by claim 47. Howell et al, however, does not provide a relationship between the various operating parameters, particularly with respect to improving the draw speed which is an important improvement of the presently claimed process. Moreover, Howell provides no apparent reason to combine the parameters in the manner recited in the present claims. *KSR Int'l. Co. v. Teleflex Inc.*, No. 04-1350, 550 U.S. ___, slip opn. at 14 (April 30, 2007).

In the only specific example provided in Howell et al (Example 1), the poly(trimethylene terephthalate) had an intrinsic viscosity of 0.90, the resulting individual filament denier was 15, and the converged filament (yarn) denier was 1200. Under these conditions, the draw speed was only 2177 yd/min (about 1990 m/min). Thus, the conditions specified in the present claims provide and require an at least 50% increase in the draw speed as compared to the conditions utilized in Example 1 of Howell et al.

Based upon the established differences between the claimed invention and the teaching of the Howell et al reference, the disclosure of the Howell et al reference would need to be modified in order to arrive at the presently claimed invention. For such modification to be obvious, there must exist some rational reason, suggestion or motivation for person of ordinary skill in the art to modify the disclosure of the Howell et al reference in the manner required to arrive at the presently claimed invention. See In re Chu, 36 U.S.P.Q. 2d 1089, 1094 (Fed. Cir. 1995). The mere fact that the prior art could be so modified does not make the modification or arrangement obvious unless the prior art suggests the desirability of such. See In

re Gordon, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984). Furthermore, in view of the Supreme Court's recent statements in the KSR case (KSR International Co. v. Teleflex Inc., 550 U.S. ___, 2007 WL 1237837, No. 04-1350 slip op. (2007)), Appellants submit that the determinative question in deciding the appropriateness of the rejections of record is whether or not the Appellants' claimed combination of steps yields predictable results with respect to being able to draw PTT yarn at the speeds and with the parameters as required by the present claims. See also Leapfrog Enterprises Inc. v. Fisher Price, Inc. and Mattel, Inc., No. 06-1402 slip op. at 7 (Fed. Cir. 2007).

At the time the present invention was made, PTT was not in commercial use for carpet. PTT had been used in making apparel, but such use would not suggest that PTT fibers could be used in making carpet. Moreover, there was no teaching or suggestion in the art, at the time the present invention was made, of the likelihood of being able to draw PTT at the relatively high speeds of greater than 3000 meters per minute. The use of such draw speeds is more than a "predictable variation", relying only on "prior art elements according to their established functions" because, Appellants submit, it was not predictable by one of ordinary skill in the art, at the time the invention was made, that such a process could be used for PTT yarns.

It is well established that a reference is only good for what it fairly teaches. As described in detail above, the present invention involves more than simply increasing the draw speed in a conventional poly(trimethylene terephthalate) bulk continuous yarn process – it includes- and requires- a specified combination of operating parameters that allows such draw speed to be significantly increased. As also discussed above, none of the secondary references in any way teach or remotely suggest how to adjust a bulk continuous yarn process in order to achieve high draw speeds for poly(trimethylene terephthalate) fibers as set forth in the claims.

It seems to be the position of the Examiner that the difference between the claimed invention and Howell et al can be characterized as a mere optimization, thus modifying Howell et al as required to achieve the presently claimed invention involves only routine skill and should be considered obvious. This position of the Examiner might be supportable if, for

example, only one parameter was altered, and the relative effect of altering that one parameter was in a general sense predictable by a person of ordinary skill in the relevant art. The presently claimed invention is not merely a simplistic optimization of the disclosure of Howell et al, but rather a specific combination of operating parameters that allows a significant increase in the draw speeds as compared to what is disclosed in the Howell et al reference.

The Appellants respectfully contend that there is nothing in Howell et al or the current record to remotely suggest that the particular combination of process steps recited in the present claims would predictably result in a process that could be used to produce bulk continuous filament PTT, with the parameters required by the present claims. There is simply nothing of record to support selecting steps and operating conditions that may be explicitly disclosed in Howell et al, or modifying steps or operating conditions not explicitly disclosed in Howell et al, in the manner required to achieve the presently claimed invention.

The rejections in view of Howell and secondary references

The rejections in view of the secondary references, and Appellants' responses thereto are set forth in more detail below.

The Examiner has repeatedly asserted that the present claims are unpatentable over Howell because, although Howell does not teach the molecular weight, melt viscosity, or draw speeds recited in the present claims, it would have been obvious to one of ordinary skill in the art to use a single screw extruder as disclosed by Hwo et al in the process disclosed by Howell. The Examiner further asserts that the melt viscosity obtained by the present process is inherent in melt extrusion of synthetic yarn, and that polymers have a number average molecular weight of 29,000 to about 40,000.

Hwo et al is cited by the Examiner as teaching a draw speed of poly(trimethylene terephthalate) of from 2450 to 10000 m/min. While Hwo et al does in fact disclose this speed, the disclosure thereof is in the context of a partially-oriented yarn (POY) process, not a bulk continuous filament (BCF) process (also referred to herein as "bulk continuous yarn" processe) as set forth in the present claims. One of skill in the art would recognize partially oriented yarn as significantly different in properties and expected applications from bulk continuous filaments. Hwo et al in fact gives no indication whatsoever as to how to adjust a bulk continuous yarn process in order to achieve these high draw speeds.

The Examiner further asserts that it would have been obvious to utilize "proper melt viscosity", which is an "optimized value of a resultant effective variable. Appellants disagree. Appellants submit that the present invention required a level of skill beyond ordinary skill, and was not merely an optimization of a parameter such as melt viscosity. Appellants maintain that "optimization" might involve incremental changes in a variable, but that the present invention arose after variations of as much as 10-20 percent in critical variables- beyond "optimization" that would be carried out by one of ordinary skill. Moreover, the mere recognition of a need for a process for forming poly(trimethylene terephthalate) bulk continuous filament yarn does not by itself suggest to one of ordinary skill in the art the presently claimed process, and would not necessarily provide a reason for

such person of ordinary skill to combine the cited references. Appellants submit that one of ordinary skill in the art might be led to attempt to use processes known for other types of yarn, but that the invention of the combination of parameters in the presently claimed invention is an accomplishment beyond the routine activity of a person of ordinary skill.

Wandel et al is cited by the Examiner as disclosing a poly(trimethylene terephthalate) having a melt viscosity as specified in claim 47. While Wandel et al does show that poly(trimethylene terephthalate) of an appropriate melt viscosity exists, Wandel et al does not in any way disclose or suggest the use of such poly(trimethylene terephthalate) in a bulk continuous yarn process, or how such use might affect the operation or results of such a process.

Sun et al is cited by the Examiner as disclosing a poly(trimethylene terephthalate) having a molecular weight as specified in claim 47. While Sun et al does show that poly(trimethylene terephthalate) of an appropriate molecular weight exists, Sun et al does not in any way disclose or suggest the use of such poly(trimethylene terephthalate) in a bulk continuous yarn process, or how such use might affect the operation of such a process.

Burton et al discloses a BCF process utilizing a cooling drum to cooled bulked filaments, but poly(trimethylene terephthalate) is not disclosed as a material suitable for use in Burton et al. There is thus no suggestion in Burton of the feasibility of the process disclosed therein for use with PTT.

Scott et al incorporates the disclosure of Howell et al with regard to producing BCF from poly(trimethylene terephthalate). The Examiner has stated that Scott et al discloses drawing poly(trimethylene terephthalate) fibers at speeds of 4000-6000 m/min, referring to the passage in Scott et al at lines 15-18 on page 12. What the cited passage in fact says is that, generally, in a spin-draw process, take up speeds are within the stated range. However, the passage says nothing about drawing speeds, or even remotely suggests how to adjust the parameters generally disclosed in Howell et al to achieve the currently claimed process and realize in-

creased drawing speeds, much less in the context of a poly(trimethylene terephthalate) fiber spinning process.

As for the "admitted prior art", the mere fact that a variety of possible poly(trimethylene terephthalate) polymers were available, or potentially could be made, does not in and of itself teach one of ordinary skill in the relevant art how to adjust the BCF process disclosed in Scott et al (or Howell et al) in a manner to achieve the presently claimed process.

Hwo et al (discussed above) adds nothing to the disclosure of Scott et al (or any other art) that would lead one of ordinary skill in the art to modify a BCF process.

"[A] patent composed of several elements is not proved obvious merely by demonstrating that each of it elements was, independently, known in the prior art." KSR, No. 04-1350 slip op. at 14. Further, the mere fact that the prior art could be modified does not make the modification obvious unless the prior art suggests the desirability of such. See In re Gordon, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984).

Even reaching beyond the specific problem addressed by the Appellants, there is no other evidence of record that any need or problem known in the field of endeavor and addressed by this application would provide a reason for combining the various elements in the manner claimed. Without such evidence, the obviousness rejection cannot stand. See KSR, No. 04-1350 slip op. at 16.

The Appellants, therefore, respectfully submit that the Examiner's position in this rejection cannot be supported legally or factually, and request withdrawal of this rejection.

CONCLUSION

In view of the above, the Appellants submit that, on the present record, the Examiner has not established a *prima facie* case of obviousness of the claims in this application, and that all of the present claims are patentable over any supportable combination of Howell with any of the other cited references. Appellants submit that it remains necessary, in establishing a *prima facie* case of obviousness, to identify the reasons why a person of ordinary skill in the art would have combined prior art elements in the manner claimed. Appellants submit that the Examiner has failed to do so.

The Appellants, therefore, submit that the presently claimed invention is patentable over the art of record, request that the rejections of record be reversed, and further request that the Examiner be directed to:

- (i) allow claims 47, 8, 11, 14, 20, 23, 24, 26, 29, 33, 41, 42, 46, 48 and 50-54, and
- (ii) advance the present application to issue at the earliest possible date.

Respectfully submitted,



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Date: 7/30/07

CLAIMS APPENDIX

- 1.(Canceled)
- 2.(Canceled)
- 3.(Canceled)
- 4.(Canceled)
- 5.(Canceled)
- 6.(Canceled)
- 7.(Canceled)
- 8.(Previously presented) The process of claim 47, wherein the melt viscosity is from about 500 to about 700 Pascals at 250°C and 48.65 per second shear rate.
- 9.(Canceled)
- 10.(Canceled)
- 11.(Previoiusly presented) The process of claim 47, wherein the filament denier is at least 15.
- 12.(Canceled)
- 13.(Canceled)
- 14.(Previously presented) The process of claim 47, wherein the yarn denier is at least 1000.
- 15.(Canceled)
- 16.(Canceled)
- 17.(Canceled)
- 18.(Canceled)
- 19.(Canceled)

20.(Previously presented) The process of claim 47, further comprising coating the filaments with a spin finish and optionally preintermingling the filaments.

21.(Canceled)

22.(Canceled)

23.(Previously presented) The process of claim 47, wherein the bulking the drawn filaments is to form 3-dimensional curvilinear crimp therein.

24.(Original) The process of claim 23, wherein the bulking comprises blowing and deforming the filaments in a hot-fluid jet bulking unit.

25.(Canceled)

26.(Previously Presented) The process of claim 47, wherein the draw ratio is about 1.2 to about 3.0.

27.(Canceled)

28.(Canceled)

29.(Previously presented) The process of claim 47, wherein the intrinsic viscosity is about 0.98 to about 1.04.

30.(Canceled)

31.(Canceled)

32.(Canceled)

33.(Previously presented) The process of claim 47, wherein the water content is less than about 40 ppm.

34.(Canceled)

35.(Canceled)

36.(Canceled)

37.(Canceled)

38.(Canceled)

39.(Canceled)

40.(Canceled)

41.(Previously presented) The process of claim 47, further comprising ply-twisting and heat setting the filaments into yarn.

42.(Original) Carpet made from the ply-twisted, heat-set poly(trimethylene terephthalate) yarn of claim 41.

43.(Canceled)

44.(Canceled)

45.(Canceled)

46.(Previously presented) The process of claim 47, wherein the process further comprises providing poly(trimethylene terephthalate) chip and drying the poly(trimethylene terephthalate) chip at about 80 to about 150°C.

47.(Previously presented) A process of forming poly(trimethylene terephthalate) bulk continuous filament yarn comprising:

- a. providing poly(trimethylene terephthalate) chip wherein the poly(trimethylene terephthalate) has a number average molecular weight of about 29000 to about 40000, an intrinsic viscosity of about 0.95 to about 1.04 dl/g, and a melt viscosity of about 450 up to about 700 Pascals at 250°C and 48.65 per second shear rate,
- b. drying the poly(trimethylene terephthalate) chip to a water content of less than about 50 ppm,
- c. melting the poly(trimethylene terephthalate) chip in a single screw extruder,
- d. extruding the poly(trimethylene terephthalate) to form filaments;
- e. cooling the filaments,
- f. converging the filaments into yarn;
- g. drawing the filaments at a speed of greater than 3500 meters per minute, at a draw ratio of about 1.1 to about 4.0, to produce filaments having a filament denier greater than 10 and yarn having a yarn denier of at least 500;

- h. bulking the drawn filaments;
- i. cooling the bulked filaments through a cooling drum,
- j. intermingling the cooled filaments, and
- k. winding the intermingled filaments on a wind-up machine.

48.(Previously Presented) The process of claim 47 wherein the bulking the drawn filaments is carried out using a bulking unit with a texturing nozzle.

49.(Canceled)

50.(Previously Presented) The process of claim 47, wherein the filaments are drawn at a speed of greater than 4000 meters per minute.

51.(Previously Presented) The process of claim 47, wherein the filaments are drawn at a speed of greater than 3500 meters per minute up to less than 5000 m/min.

52.(Previously Presented) The process of claim 47, wherein the draw ratio is about 1.4 to about 2.2.

53.(Previously Presented) The process of claim 47, wherein the intrinsic viscosity is about 1.00 to about 1.02 dl/g.

54.(Previously Presented) The process of claim 47, wherein the intrinsic viscosity is about 0.95 to about 1.02 dl/g.

55.(Canceled)

56.(Canceled)

RELATED PROCEEDINGS APPENDIX

NONE